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Signed M Cooke

Dated 16 August 2000

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09JUL99 E460854-2 D02917
P01/7700 0.00 - 9916081.4

Request for grant of a patent

The Patent Office
Cardiff Road
Newport
Gwent NP9 1RH

1. ~~Your reference~~
1829901/AM

2. Patent Application Number
9916081.4 08 JUL 1999

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

Scientific Generics Limited
Harston Mill
Harston
Cambridgeshire CB2 5NH

Patents ADP number *(if known)* 06935740003

If the applicant is a corporate body, give the country/state of its incorporation — Country: **ENGLAND** State:

4. Title of the invention

BEAM ALIGNMENT SYSTEM

5. Name of agent — **Beresford & Co**

"Address for Service" in the United Kingdom to which all correspondence should be sent

2/5 WarwickCourt
High Holborn
London WC1R 5DJ

Patents ADP number 05200001

6. Priority details

Country	Priority application number	Date of filing

Patents Form 1/77

7. If this application is divided or otherwise derived from an earlier UK application give details

Number of earlier of application — Date of filing

8. Is a statement of inventorship and or right to grant of a patent required in support of this request?

YES

9. Enter the number of sheets for any of the following items you are filing with this form.

Continuation sheets of this form	
Description	2
Claim(s)	
Abstract	
Drawing(s)	2 x2

10. If you are also filing any of the following, state how many against each item.

Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent *(Patents form 7/77)*	**1 + 2 COPIES**
Request for preliminary examination and search *(Patents Form 9/77)*	
Request for Substantive Examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. I/We request the grant of a patent on the basis of this application

Signature Beresford & Co — Date 8 July 1999

BERESFORD & Co

12. Name and daytime telephone number of person to contact in the United Kingdom

ALAN MACDOUGALL

Tel:0171-831-2290

Beam Alignment System

Background

The applicant has described in WO98/35328 an optical communication system employing a pixellated reflective modulator array combined with a telecentric optical system. The system operates by assigning each user of the system a unique pixel in the array. Each pixel in the array maps to a unique angular position in the field of view of the telecentric optical system (figure 1). The content of WO98/35328 is incorporated herein by way of reference.
In such systems, the beam from the receiver end illuminates the telecentric stop of the modulator optical system. In many cases, the beam from the receiver is expanded such that it overfills the telecentric stop. In this way, the effect of any misalignment of the beam is reduced, but at the cost of increased system loss due to the fact that much of the laser beam misses the stop.

Our invention concerns methods by which the effects of misalignment may be avoided without the need to introduce additional optical loss.

Description of our Invention

Our invention makes use of the fact that the level of reflection from the telecentric modulator may be sensed by the receiver, and that action may be taken to maximise this reflection. The level of reflection may be monitored simply by measurement of the peak signal level received from the modulator.

According to the first aspect of our invention, we employ a set of moveable beam steering mirrors, which are capable of steering the beam from the receiver. The beam steering system would typically consist of two mirrors, mounted with their axes orthogonal (figure 2), such that they control orthogonal movements of the beam, although other arrangements are possible. The mirrors are used to steer the beam onto the telecentric stop such that the reflected light is maximised.

According to the second aspect of our invention, we employ a beam steering method which has previously been applied to camera lenses and binoculars to overcome the effects of image movement and instability caused by the person holding the camera or binoculars. In this system, a number of wedge prisms are introduced into the optical system, which can be moved by, for example, motors are voice-coils, in a direction orthogonal to the optical axis of the system and hence produce movement of the image. In the case of camera lenses or binoculars, control signals for the image steering system are derived from accelerometers which sense the vibration induced by the user. According to our invention, the control signals are derived from the received signal strength.

The beam from the receiver is typically non-uniform, and in many instances will have an approximately Gaussian profile. Therefore, there will be a number of beam positions which give the same reflected signal strength (figure 3). In order than the control system can determine the direction in which to steer the beam for maximum signal strength, the system will preferably employ a phase sensitive detection technique. In this technique, a small amplitude oscillation is applied to each of the two mirrors. The resulting small modulation is the received signal strength (due to the oscillation of the mirrors) is detected by mixing with the modulating signal. Following low pass filtering, a signal is derived whose amplitude is dependant on the alignment of the beam, and whose sign is determined by the direction of the maximum. The two mirrors should preferably be driven at different frequencies, which are not harmonically related, in order than there be no crosstalk between the signals derived for the orthogonal mirrors.

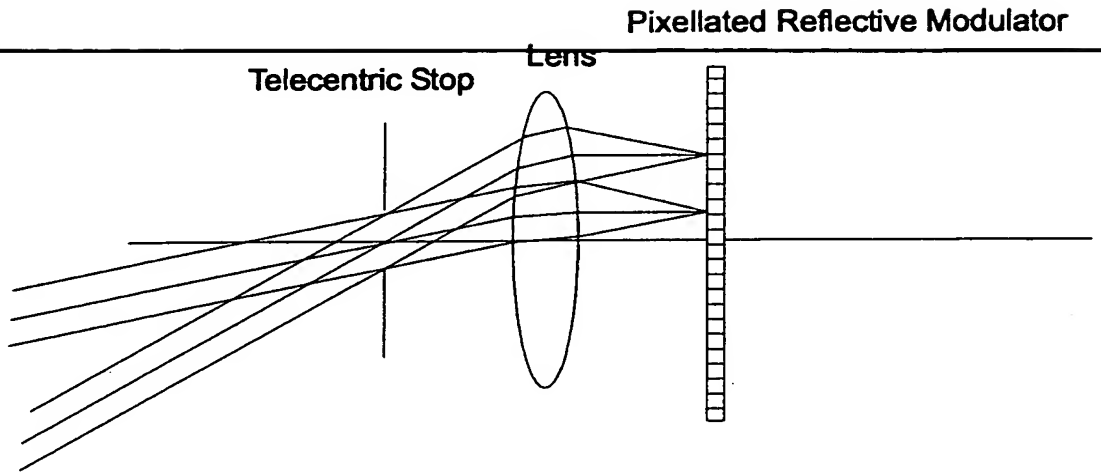

Figure 1

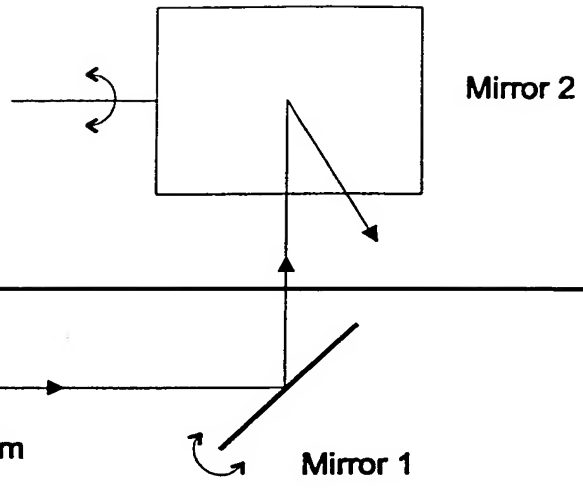

Figure 2

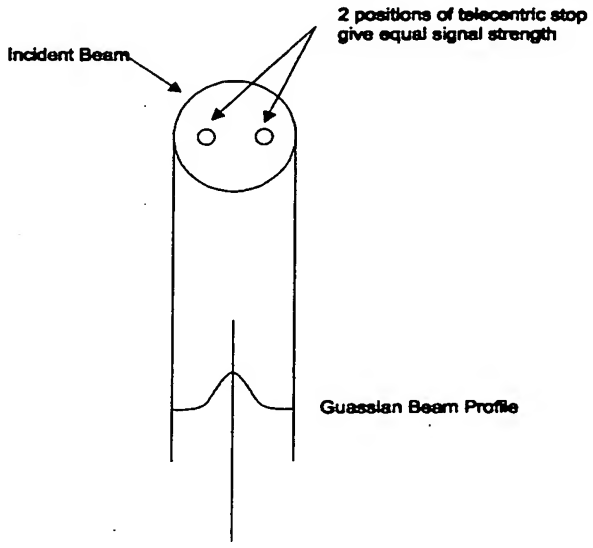

Figure 3